



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 33

[Docket No. FAA-2012-0745; Special Condition No. 33-012-SC]

Special Conditions: GE Aviation CT7-2E1 Turboshift Engine Model.

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These final special conditions are issued for the General Electric Aviation (GE) CT7-2E1 engine model. This engine model will have a novel or unusual design feature, which is a combination of two existing ratings into a new rating called “flat 30-second and 2-minute OEI” rating. This rating is intended for the continuation of flight of a multi-engine rotorcraft after one engine becomes inoperative. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These final special conditions contain the additional safety standards the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: The effective date of these special conditions is [insert date 30 days after publication in the Federal Register].

FOR FURTHER INFORMATION CONTACT: For technical questions concerning this rule, contact Dorina Mihail, ANE-111, Engine and Propeller Directorate, Aircraft Certification Service, 12 New England Executive Park, Burlington, Massachusetts 01803-5299; telephone (781) 238-7153; facsimile (781) 238-7199; e-mail dorina.mihail@faa.gov. For legal questions concerning this rule, contact Vincent Bennett, ANE-7, Engine and Propeller Directorate, Aircraft

Certification Service, 12 New England Executive Park, Burlington, Massachusetts 01803-5299; telephone (781) 238-7044; facsimile (781) 238-7055; e-mail vincent.bennett@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

On September 10, 2009, GE applied for an amendment to type certificate E8NE to add the new CT7-2E1 turboshaft engine model. The CT7-2E1 engine model is a derivative of the CT7 engine family certified between 1977 and 2010. It is a free turbine turboshaft designed for a transport category twin-engine helicopter. The CT7-2E1 engine model will incorporate a novel and unusual feature, which is the “flat 30-second and 2-minute OEI” rating. The applicant requested this rating to provide the increased power required for the rotorcraft performance. A special condition is necessary to apply additional requirements for the rating’s definition, overspeed, controls system, and endurance test, because the applicable airworthiness standards do not contain adequate or appropriate airworthiness standards to address this design feature.

The “flat 30-second and 2-minute OEI” rating is equivalent in some regards with the 2 ½-minute OEI rating, and in other regards with the 30-second OEI and the 2-minute OEI ratings. However, the new rating differs from the 2 ½-minute OEI rating because it limits the number of occurrences per flight and mandates post-flight inspection and maintenance actions. The new rating is similar with the combined or joined 30-second OEI and 2-minute OEI ratings when they are equal. However, the existing standards are not adequate for this combination.

Similar to the “flat 30-second and 2-minute OEI” rating, the 30-second and 2-minute OEI ratings were introduced to provide multi-engine rotorcraft with high power for short periods of time when an engine becomes inoperative during critical flight conditions. Existing airworthiness standards for the 30-second OEI and 2-minute OEI ratings were established based

on the assumption the two ratings will be selected together as a package, and that the 30-second OEI rating is higher than the 2-minute OEI rating. Because the 30-second OEI rating was assumed higher, specific requirements were established for only this rating and for the 30 second time period. When the 30-second and 2-minute OEI ratings are equal, these requirements must be extended to a total period of 2.5 minutes.

These final special conditions for the “flat 30-second and 2-minute OEI” rating are based on a combination of existing regulations for the 2 ½-minute OEI rating, and the 30-second and 2-minute OEI ratings. Under the provisions of § 21.101(d), the special conditions must provide a level of safety equal to that established by the regulations in effect on the date of the application for the change.

We determined that the type certification basis for the GE CT7-2E1 engine model is up to and including Amendment 20 of part 33; refer to the section below titled “Type Certification Basis.” We also determined that the part 33 standards, up to and including Amendment 25, contain part of the standards for the “flat 30-second and 2-minute OEI.” Therefore, we do not prescribe special conditions when the requirements exist in later amendments, instead we will apply these later amendments. These later requirements are:

(1) Section A33.4, Airworthiness Limitations Section, paragraphs (b)(1) and (b)(2) of Amendments 1-25, and

(2) Section 33.5, Instruction manual for installing and operating the engine, paragraph (b)(4) of Amendments 1-25.

These final special conditions are in addition to the requirements of the 30-second and 2-minute OEI ratings that remain applicable to the “flat 30-second and 2-minute OEI” rating, as follows:

(1) These final special conditions extend the standards applicable to the 30-second or 2-minute OEI ratings for the 2.5 minute time duration of the “flat 30-second and 2-minute OEI” rating. We developed these special conditions by revising the time dependent requirements of §§ 33.27, 33.87(a)(7), and 33.88(c). The 2.5 minute time duration for the rating would affect the structural and operational characteristics of the engine that are time dependent, such as the values for transients, time duration for stabilization to steady state, and part growth due to deformation. In addition, these special conditions are applied by extending the 30-second OEI rating requirements of § 33.67(d) for automatic availability and control of the engine power, from 30 seconds to 2.5 minutes.

(2) These final special conditions are required to account for the proposed rating of a 2.5 minute time duration during the endurance test. For the 30-second and 2-minute OEI ratings, the test schedule of § 33.87(f) is divided among the two ratings. We applied these special conditions by revising the requirements of § 33.87(f) to ensure the test will run for a 2.5 minute duration with no interruption.

Type Certification Basis

Under the provisions of 14 CFR 21.101(a), GE must show the CT7-2E1 turboshaft engine model meets the provisions of the applicable regulations in effect on the date of application, except as detailed in § 21.101(b) and (c). We have determined the following certification basis for the CT7-2E1 turboshaft engine model.

(1) 14 CFR part 33, “Airworthiness Standards: Aircraft Engines,” dated February 1, 1965, with Amendments 1 through 20, except §§ 33.5(b)(4), A33.4(b)(1), and A33.4(b)(2), Amendments 1-25 applicable to the “flat 30-second and 2-minute OEI” rating. The applicant will voluntarily comply with § 33.28, Amendments 1-28 for the EECU, FMU, and AISBV.

(2) 14 CFR part 34, Amendments 1 through 4, § 34.11 “Standard for Fuel Venting Emissions.”

Under the provisions of 14 CFR 21.101(d), if we find the regulations in effect, on the date of the application for the change, do not provide adequate standards with respect to the proposed change because of a novel or unusual design feature, the applicant must also comply with special conditions, and amendments to those special conditions prescribed under the provisions of § 21.16 to provide a level of safety equal to that established by the regulations in effect on the date of the application for the change.

We issue special conditions, as defined by 14 CFR 11.19, under 14 CFR 11.38, which become part of the type certification basis as specified in §§ 21.17(a)(2) or 21.101(d).

Special conditions are initially applicable to the engine model for which they are issued. If the type certificate for that model is amended later, to include another related model that incorporates the same or similar novel or unusual design feature, or if any other model already included on the same type certificate is modified to incorporate the same or similar novel or unusual design feature, these special conditions may also apply to the other model.

Novel or Unusual Design Features

The CT7-2E1 turboshaft engine model will incorporate a “flat 30-second and 2-minute OEI” rating for use after the failure or shutdown of one engine and for up to three periods of 2.5 minutes each on any one flight. These final special conditions, discussed below, for the “flat 30-second and 2-minute OEI” rating will address this novel and unusual design feature.

Discussion of Comments

A notice of proposed special conditions, No. 33-12-01-SC, for the CT7-2E1 turboshaft engine model was published on July 20, 2012 (77 FR 42677). We received six comments from

European Aviation Safety Agency (EASA) and two from Honeywell. One comment from EASA resulted in changes to the special conditions; the remaining comments resulted in clarifications.

The EASA commented that the special conditions for the overspeed test of § 33.27 should not be the same as the requirements applicable to the 2 ½ -minute OEI rating. EASA considers that applying the overspeed test requirements associated with the 30-second and 2-minute OEI ratings would be more appropriate.

We partially agree. We agree the requirements for the 30-second and 2-minute OEI ratings are more appropriate, except for the test time duration requirement. For the CT7 engine model, the overspeed requirements for the 30-second and 2-minute OEI ratings reside in the special conditions 33-002-SC, published on May 28, 1999 (64 FR 28900). We are therefore adopting these requirements, except that the time duration of paragraph (a) of 33-002-SC is increased from 2.5 minutes to 5 minutes in these final special conditions. The rationale is that the test time duration should be representative of the rating duration, which is 2.5 minutes at the flat 30-second and 2-minute OEI rating versus 30 seconds at the 30-second OEI. Also, the 5 minutes test time is the same as that applied to the 2 ½ -minute OEI rating, which is a rating of the same time duration.

The EASA commented that amendments to §§ 33.67(d) and 33.28(k) are discussed, despite not being addressed under the part 33 requirements section of the proposed special conditions. The EASA found this section unclear and suggested that additional clarification be provided.

We agree. We eliminated the references to § 33.28(k) and assigned the special conditions to § 33.67(d), instead of § 33.28(k). This resulted in no change to the proposed special conditions

themselves because § 33.28(k), Amendment 26 and § 33.67(d) Amendment 18, contain the same requirements.

Honeywell and EASA provided comments related to the “Note” in the proposed special conditions paragraph (e)(1). The note addressed the intent for temperature stabilization. Honeywell recommended revising the note for clarity. The EASA stated that the note is confusing.

We agree. We determined the note is not necessary and removed the note in the final special conditions.

The EASA commented that for the overtemperature tests of § 33.88, the existing requirements are for a 4 minute demonstration at 35 degrees F, hotter than the maximum temperature limit for the 30 second OEI rating. The proposed special conditions, however, amend this requirement by increasing this demonstration to 5 minutes duration. The EASA does not see the technical grounds for this increase in severity.

We do not agree. The 4 minute test duration applies to ratings of 2 minutes and shorter. The 5 minute test duration applies to ratings longer than 2 minutes. Since the flat 30-second and 2-minute OEI is a rating of 2.5 minutes length, the test time requirements should be a 5 minute duration; the same as that for the 2 ½-minute OEI.

The EASA commented on the applicability of Appendix A to part 33, A33.4 (b)(1) to the flat 30-second and 2-minute OEI rating. Specifically, that the flat 30-second and 2-minute OEI rating is a single rating, while the requirement of A33.4 (b)(1) applies to either 30-second OEI or 2-minute OEI ratings. EASA stated that the existing requirements are written for the existing ratings and not for the ‘new’ rating introduced by these special conditions, therefore, is not clear whether these requirements are relevant to the ‘new’ rating.

We do not agree. The airworthiness standards of Appendix A to part 33, A33.4 (b)(1) for the 30-second OEI and 2-minute OEI ratings were established based on the assumption that the two ratings will be selected together as a package. Paragraph A33.4 (b)(1) does not prescribe specific requirements for the 30-second OEI versus 2-minute OEI ratings and provides requirements for the use of both ratings. Therefore, A33.4 (b)(1) requirements for maintenance actions associated with the use of the 30-second and 2-minute OEI ratings apply to the new rating.

Honeywell provided a comment related to the naming of the rating, which, although recognizable, appears cumbersome. Honeywell suggested that, “Rated limited use 2½-minute OEI” could be a better definition that would still distinguish it from the existing unlimited use of the 30-second, 2-minute, and 2½-minute OEI ratings.

We do not agree. The applicant requested the new rating be named in closer relation with the 30-second and 2-minute OEI ratings for consistency across existing engine models and to align the new rating with the 30-second and 2-minute-OEI ratings at the rotorcraft level. We agree with the applicant’s proposed name. We also do not agree with the commenter that the 30-second and 2-minute OEI ratings are “unlimited use.” These ratings are limited to a maximum use of 3 times per flight and require post-flight inspection, per 14 CFR 1.1, Definitions.

Applicability

These special conditions are applicable to the GE CT7-2E1 turboshaft engine model. If GE applies later for a change to the type certificate, to include another closely related model incorporating the same novel or unusual design feature, these special conditions would apply to that model, as well. This is true, provided the certification basis is the same or contains later

amendments that satisfy the certification basis discussed in the section titled, “Type Certification Basis.”

Conclusion

We reviewed the available data and determined that air safety and the public interest require adopting these special conditions. This action affects certain novel or unusual design features on the CT7-2E1 turboshaft engine model. It is not a rule of general applicability and applies only to GE, whom requested FAA approval for this engine feature.

List of Subjects in 14 CFR Part 33

Air transportation, Aircraft, Aviation safety, Safety.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, the FAA issues the following special conditions as part of the type certification basis for the GE CT7-2E1 turboshaft engine model.

1. Part 1 Definitions

Unless otherwise approved by the Administrator and documented in the appropriate manuals and certification documents, the following definition applies: “Rated Flat 30-second and 2-minute One Engine Inoperative (OEI) Power,” with respect to rotorcraft turbine engines, means: (1) a rating for which the shaft horsepower and associated operating limitations of the 30-second OEI and 2-minute OEI ratings are equal, and (2) the shaft horsepower is that developed under static conditions at the altitude and temperature for the hot day, and within the operating limitations established under part 33. The rating is for continuation of one flight operation after the failure or shutdown of one engine in multiengine rotorcraft. The rating is for

up to three periods of use no longer than 2.5 minutes each in any one flight, and followed by mandatory inspection and prescribed maintenance action.

2. Part 33 Requirements

(a) In addition to the airworthiness standards in the type certification basis applicable to the engine and the 30-second and 2-minute OEI ratings, the special conditions in this section apply.

(b) Section 33.7 Engine ratings and operating limitations. Flat 30-second and 2-minute OEI rating and operating limitations are established by power, torque, rotational speed, gas temperature, and time duration.

(c) Section 33.27 Turbine, compressor, fan, and turbosupercharger rotor overspeed.
In addition to the requirements of § 33.27(b):

(1) The turbine and compressor rotors must have sufficient strength to withstand the test conditions specified in paragraph (2) below.

(2) The applicant must determine, by analysis or other acceptable means, the most critically stressed rotor component of each turbine and compressor, including integral drum rotors and centrifugal compressors. These components must be tested for the conditions in paragraphs (i) or (ii) below. The test selection from the following paragraphs (i) or (ii) below is determined by the speed defined in paragraph (i)(B) or (ii)(B), whichever is higher.

(i) Test for a period of 5 minutes:

(A) At its maximum operating temperature, except as provided in § 33.27(c)(2)(iv); and

(B) At the highest speed determined, in accordance with § 33.27(c)(2)(i) through (iv).

(C) This test may be performed using a separate test vehicle as desired.

(ii) Test for a period of 5 minutes:

(A) At its maximum operating temperature, except as provided in paragraph (ii)(C) below; and

(B) At 100 percent of the highest speed that would result from failure of the most critical component of each turbine and compressor, or system, in a representative installation of the engine when operating at the flat 30-second and 2-minute OEI rating conditions; and

(C) The test speed must take into account minimum material properties, maximum operating temperature, if not tested at that temperature, and the most adverse dimensional tolerances.

(D) This test may be performed using a separate test vehicle as desired. Following the test, rotor growth and distress beyond dimensional limits for an overspeed condition are permitted provided the structural integrity of the rotor is maintained, as shown by a procedure acceptable to the FAA.

(d) Section 33.67(d) Fuel system. Engines must incorporate a means, or a provision for a means, for automatic availability and automatic control of the flat 30-second and 2-minute OEI power for the duration of 2.5 minutes and within the declared operating limitations.

(e) Section 33.87 Endurance test. The requirements applicable to 30-second and 2-minute OEI ratings, except for:

(1) The test of § 33.87(a)(7) as applicable to the 2 ½-minute OEI rating.

(2) The tests in § 33.87(f)(2) and (3) must be run continuously for the duration of 2.5 minutes, and

(3) The tests in § 33.87(f)(6) and (7) must be run continuously for the duration of 2.5 minutes.

(f) Section 33.88 Engine overtemperature test. The requirements of § 33.88(c), except that the test time is 5 minutes instead of 4 minutes.

Issued in Burlington, Massachusetts on March 4, 2013.

Robert J. Ganley
Acting Manager, Engine and Propeller Directorate
Aircraft Certification Service.

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